# Gas Journal

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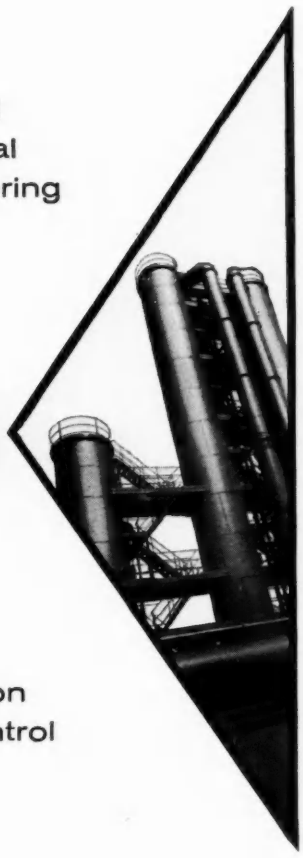

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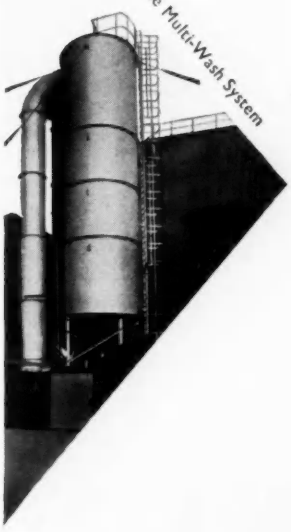

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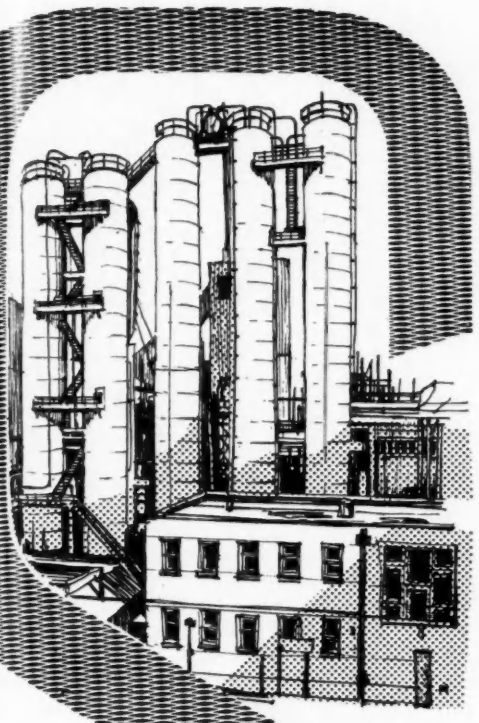

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# Gas Journal

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PUBLISHERS' NOTICE, See Page 79, April 8, 1959

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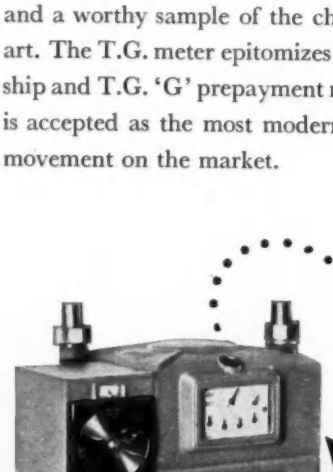
# something in common

They remind one of different worlds, the antique chair of 1680-1700 and the modern T.G. meter. Yet they *have* something in common — both are the products of true craftsmanship. The chair, in the style popularly known as 'William and Mary', is attributed to Daniel Marot who designed much of the furniture for Hampton Court Palace. It is presented here as a fine example of furniture design of that period and a worthy sample of the chairmakers' art. The T.G. meter epitomizes craftsmanship and T.G. 'G' prepayment mechanism is accepted as the most modern precision movement on the market.



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# Gas Journal

VOLUME 298. No. 4999 MAY 6, 1959. 111th YEAR

## *The Battle Against Corrosion*

THE cost of corrosion in the U.K. had been estimated at £600 mill. a year, which is equivalent to 2s. in the £1 of the standard rate of income-tax. Sir Owen Wansborough-Jones, Chief Scientist, Ministry of Supply, said this when he opened the 1959 Corrosion Exhibition, which was held at the Royal Horticultural Society's New Hall, Westminster, last week. The most important effect of corrosion, Sir Owen suggested, was not the immediate damage it did, but the more subtle losses in reliability, extra costs in maintenance, and extra wear in mechanical equipment which it caused. He is absolutely right and this appears to be an appropriate opportunity to review briefly some of the developments in the field of protective coatings which are calculated to reduce this menace.

Long past are the days when paint was just paint. Today it has become a highly scientific product, and much research and development work has gone into the production of the modern heavy-duty industrial coatings. If the potential user finds the choice somewhat bewildering, it also affords him the knowledge that there is 'a paint for the job,' however diverse and exacting the conditions of service. It may be useful to consider a few examples.

The gas industry has been familiar for some years with the zinc-rich paints, these being synonymous with such terms as cold galvanising, metal coatings, etc. As the name implies, these are paints in which there is incorporated a sufficiently high percentage of metallic zinc pigment to ensure direct electronic contact both between the zinc particles themselves and between them and the structures to which the coating is applied. Due to the principle upon which it acts, a zinc-rich paint is effective at the edges of any break in the coating, and thus tends to inhibit rust which may occur at the point of penetration and prevent its spread. It is claimed that this type of coating acts in similar manner to hot-dip galvanising. Given proper preparation of the material to be treated, it is a valuable member of the anti-corrosion team and has wide application in the protection of steel structures, etc., used either as a primer or as a complete coating system.

We feel that some mention should be made of chlorinated rubber-based coatings which are frequently used as follow-on coats over a primer such as a zinc-rich paint. Chlorinated rubber as a paint medium offers such protective properties as excellent waterproofing and resistance to attacks by acids, alkalis and solvents; and it may incorporate rust-inhibiting pigments or fungicidal ingredients, as well as lending itself admirably to the inclusion of coloured decorative pigments. When used upon steelwork it is preferably employed as a finisher in combination with a suitable priming paint; but it can also be applied successfully to a variety of alkali-containing materials. e.g., concrete, asbestos, cement, brickwork, etc., with the additional virtue that it may be applied over old paint (except tar or bitumen).

In latter years the production of new and improved industrial protective coatings has been associated very closely with—one might almost say revolutionised by—developments in the plastics industry. The tremendous and continuing activity in the field covered by the generic term plastics has opened up new avenues of approach to the problem of corrosion resistance, and this is reflected in the wide range of plastic-based coatings now available.

Among the earlier synthetic resins the alkyds—derived from polybasic acids/polyhydric alcohols—were used extensively in the manufacture of industrial paints, but they appear now to have been largely superseded by other groups which afford enhanced protective properties to the end product. It has been established that coatings based upon the isocyanite resins (polyurethanes) offer very high resistance to water, distilled water and water vapour (always a ticklish problem) as well as to a wide range of searching solvents and chemicals. Heat resistance also is extremely good. Polyurethane-based coatings therefore commend themselves for a variety of difficult conditions, frequently as a complete coating system. The number of coats recommended is, of course, determined by the anticipated conditions of service as well as by the nature of the material to be protected, e.g., steelwork, concrete or other porous surfaces. This class of coating seems to find much favour in chemical

plants, and has also been used effectively in such testing conditions as the lining of tanks subject to heavy corrosive action, hot water storage, and so on.

Perhaps the most important advance of recent years in the development of heavy-duty protective coatings has been associated with the introduction of the epoxide (or epoxy) resins. These are produced by reacting epichlorhydrin and a dihydric phenol in alkaline solution at a suitable temperature. Early work upon this class of condensation polymers was carried out on the Continent and in the U.S.A., but for some years past a range of epoxy resins, mainly based upon epichlorhydrin/diphenylpropane, has been in full commercial production in this country. The epoxides have a variety of applications in industry, among which incorporation in surface coatings is certainly one of the more important. They offer greater chemical resistance than the alkyds; and other properties which have established their value as base material are excellent adhesion, low shrinkage, hardness and flexibility. In fact, finishes based upon epoxy resins would seem to combine all the desirable qualities one looks for in a protective coating.

While it is natural enough to claim 'super' properties for a new introduction, there is no lack of evidence to show that in the relatively few years they have been on the market, epoxy-based coatings have in fact achieved outstanding success over a wide field. In the gas industry in particular epoxy-based paints have been used for the protection of gasholders, overhead steel mains, etc. They have been employed for the internal coating of pipes conveying corrosive liquids; in chemical plants. breweries, paper mills; on sea-going craft, and on steelwork (e.g., barge bottoms) subjected to the ferocious attack of Thames water. An epoxy-based coating was given to the interior of the swimming bath at Melbourne used for the Olympic Games there. Another interesting application recorded was in connection with the post-war reconstruction of the Royal Swimming Bath at Bath. The chemical constituents of the hot spring water at this famous spa are decidedly less beneficial to metals and other materials exposed to the bath's atmosphere than they are to the patients using the bath. To determine the type of protective coating which should be applied to various parts of the building and equipment, test panels were left for several months actually in the subterranean spring chamber of the Roman Baths. The result of this severe test was overwhelmingly in favour of an epoxy-based material.

A recent development, fast gaining ground, is the combination of the well-known properties of coal tar with those of epoxy resins and thus, in a sense, to give the user the best of both worlds. There would seem to be a considerable field for these coal tar-epoxy coatings. By the nature of the material, it affords a thicker coat than is normally obtained, and substantial cover may be built up with minimum labour cost. Moreover, a coal tar-epoxy coating is not too fussy as regards preparation of the material to be treated; it cures to a hard, tough finish and—a not unimportant consideration—calls for no specially skilled labour in applying it. Coal tar-epoxy coatings may be used as a complete system or may be followed by a standard epoxy paint as finisher.

In discussing some modern trends in anti-corrosive surface coatings we do not overlook the valuable service still being given by old friends such as the bitumastics, but these are so well known that there is no need to enlarge upon them. But we cannot help wondering: Where do we go from here? There are new potentials in corrosion-affecting influences, not yet fully assessed, to be considered—for example, atomic energy. It is really no exaggeration to say that efficient protection against corrosive action is a major factor in safeguarding the national economy, for though paint may be a costly item on a large scale, it is negligible by contrast with the damage that may be inflicted by the insidious enemy corrosion if it is given half a chance.

## *Tail Gases at Romford*

THE inauguration of the new Romford gasworks of the North Thames Gas Board by Lord Mills, Minister of Power, last week, is yet another step forward in the realisation of the 'new' gas industry. Like the new works at the Isle of Grain, there is no carbonising plant and oil products are the raw material for gasmaking, but unlike it, it is 17 miles from its source of fuel. Purified tail gases, containing a negligible amount of inorganic sulphur are brought by steel pipe-line from the Shell Haven refinery to Romford for reforming and subsequent distribution through the London grid main, extending from Southend to High Wycombe.

Other sources of supply are the imported methane from the Canvey Island storage tanks and tail gases from the refinery at Coryton which will be arriving at Romford shortly.

The original conception of building a plant of this type was the result of the shortage of gasmaking coals a few years ago when American coal was being imported for this purpose, and the likelihood of a large increase in the availability of refinery tail gases in the Thames area became apparent.

The plant, an Onia-Gegi, installed by Humphreys & Glasgow Ltd., consists of four gas reforming units, working in pairs and each with a design capacity of 9 mill. cu.ft. per day, and an oil gasification plant capable of gasifying any oil feedstock from primary flash distillate (P.F.D.) to heavy oil of 1,000 seconds' viscosity, divided up in two units each of 2 mill. cu.ft. per day. P.F.D. can also be used in case of emergency on one of the two pairs of reforming plants.

Reforming refinery gas on this very large scale was something quite new and it was impossible for either the Board or the Contractors to estimate exactly the actual gas making capacity of the plant. As far as available information went, each unit would be capable of making 9 mill. cu.ft. per day of an output gas of 500 B.t.u. per cu.ft. The actual capacity has exceeded these estimates and 36 mill. cu.ft. per day has been made by three units. With the existing water gas plant and other gasmaking plant on the site, the total capacity of the works should be at least 50 mill. cu.ft. per day, making it the second biggest plant in the Board's area.

Although the building of this plant is, we think, a big step forward in producing a less expensive gas of very low sulphur content, the future of gasmaking from coal of the cheaper qualities is still largely unsolved. So quickly do conditions of fuel availability change that the shortages of yesterday become the surpluses of today. For complete flexibility and the most economic use of all available sources more work must be carried out on town gas from coal by complete gasification.

# Personal

MR. C. A. LEWIS has severed his 31 years connection with Radiant Heating Ltd., and is to join Standard Sales Ltd., as Home Sales Manager. Mr. Lewis joined Radiant Heating Ltd., in 1928 as a junior in the drawing office. He spent several years going through the works, including the refractory, machine and fitting shops, and in addition dealt with the servicing of the company's appliances outside. In 1935, at the age of 21 years, he was appointed chief draughtsman. A year later he combined his duties with those of works manager. He was in charge of the works almost up to the time when Mr. Arthur Docking retired. In 1946 he was appointed general manager and administered the works, drawing office, buying and sales departments. Three years later he was appointed a director, handling advertising, the design of leaflets and exhibition stands. Mr. Lewis resigned as technical director.

MR. W. BODEN has been appointed General Manager, Technical Services, Stanton Ironworks Co., Ltd. Mr. Boden joined the company in 1922 and had been manager of the Technical Services Departments since 1943. MR. E. N. ANDREWS, who succeeds Mr. Boden as Manager, Technical Services Department, joined the company in 1931.

MR. W. R. BRADBURN, Sales Manager of the Northern Gas Board, Darlington Division, has been elected a Vice-Chairman of the Tees-side branch of the Incorporated Sales Managers' Association. Mr. Bradburn has been in the gas industry since 1928.

MR. R. S. HEWITT has joined the board of Elliott Brothers (London) Ltd. Mr. Hewitt started his career with Elliott Brothers in 1928 and is Deputy Controller of Elliott-Automation.

MR. J. A. BECKETT has been made Under-Secretary to the Minister of Power, and succeeds MR. OWEN FRANCIS in charge of the Gas Division.

# Obituary

MR. DONALD VERDI LEWIS, group production engineer of the North Western Gas Board's East Lancashire Group, has died, aged 52. Mr. Lewis learned his gas engineering as a pupil at Widnes under the famous Isaac Carr, father of the late Colonel W. M. Carr, first chairman of the North Western Gas Board. While at Widnes, Mr. Lewis helped to produce what was then the cheapest gas made anywhere in the world. In 1925 he joined Drakes Ltd., the carbonisation engineers, as an assistant draughtsman, and two years later went on to the Stockport Gas Department as chief chemist. After periods with the Keighley and St. Helens Gas Departments he went in 1944 as deputy engineer and manager to Salford and became engineer and manager in 1946. From 1954 he had been group production engineer of the North Western Gas Board's East Lancashire Group. Mr. Lewis was a prominent Freemason and a Past Master of Northern Star Lodge.

MR. ALAN H. NICHOLSON, General Manager of the North Western Gas Board's East Lancashire Group, writes:—

'The death of Donald Lewis has not come as a surprise, but it has created a profound sense of loss and sorrow among those of us who have been privileged to be closely associated with him. Some three years ago he contracted a most distressing illness which has progressively affected his ability to live a normal life. He bore this affliction with his customary cheerfulness and with an enduring courage which I have never seen equalled. His great determination to carry on and fight what he must have known was a losing battle, cannot be adequately described in words. An example of this is illustrated by the fact that he was coming to business, until fairly recently, although completely unable to walk. We constructed for him a special sedan type of chair which he used in his office, and in which he was carried wherever he wanted to go. He was never short of willing helpers, and his courage and fortitude commanded admiration and affection wherever he went. "Bac," as he was known locally, joined the staff of the East Lancashire Group about five years ago when he was apparently in normal health, and immemediately gained for himself the respect, loyalty and affection of his colleagues. He had a very charming and cheerful personality which readily attracted friendship, and he was warm-hearted and generous in the extreme. He loved and enjoyed life and always endeavoured to not only get the maximum out of it for himself but also for those with whom he associated. One could never have a more delightful and helpful colleague, and his presence will be missed by us all.'

MR. T. W. T. HAMMERTON, a former general manager and secretary of the East Hull Gas Company, died last month, a few days short of his 84th birthday. He started with the company as a weigh clerk in 1898, rising to the position of secretary. Immediately after the outbreak of World War II he was appointed manager and held the appointments of general manager and secretary until his retirement, after 50 years' service, in 1948. From then until vesting date he served as director of the company. On the formation of the North Eastern Gas Board Consultative Council, Mr. Hammerton was appointed chairman of the Hull local committee, which he served until his 80th birthday.

MR. THOMAS DAWKINS OLVER, M.B.E., deputy general manager of the North Western Gas Board's Manchester Group, has died, aged 53. Mr. Olver received his early training with the Stockton-on-Tees Corporation Gas Department, moving later to Burnley, where he rose to the position of deputy engineer and manager. In 1947 he was promoted engineer and manager of the Warrington Corporation Gas Department. His connection with Manchester began in 1950, when he was appointed group production engineer. His appointment as deputy general manager dated from 1956. He was awarded the M.B.E. in 1953 for services to the gas industry.

His General Manager, MR. JOHN WILSON, a friend and colleague for ten years, writes:—

'Much as I appreciated Tom Olver as a first-class officer and a highly qualified technician, he has been even more closely attached to me as my very good friend for the past ten years. In the early days we passed through, no doubt with many others, some extremely anxious times, and it is in such circumstances one sees the best attributes of any man. It was on that firm foundation that our friendship was built, and whatever the circumstances, that friendship and loyalty for which he was known throughout the North West never wavered. He will be sorely missed by us all, not only for those sterling qualities which he possessed in such full measure, nor entirely because of his unstinting help and his energy. We shall miss also his good humour and his anecdotes of cricketing and fishing experiences. In the latter, his enthusiasm far outweighed his skill, while in the former his skill and enthusiasm were only comparable with the manner in which he carried out his official duties.'

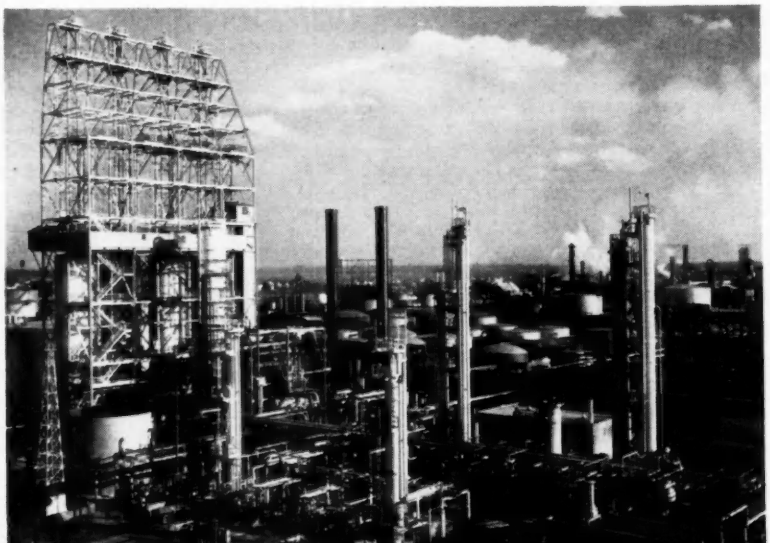
SIR WILLIAM LARKE, K.B.E., a leading figure in the metallurgical industry, has died, aged 84 years. He served as director of the National Federation of Iron and Steel Manufacturers for over 20 years. Sir William had been president of the Junior Institution of Engineers and of the Institute of Fuel, and sat on the Advisory Committee of the Privy Council for Scientific and Industrial Research. He had also been president of the Institute of Welding and of the British Standards Institution. He was a member of the Institution of Electrical Engineers, a Fellow of the Institution of Fuel and a member of the Institution of Mechanical Engineers as well as an honorary Doctor of Science of the University of Durham.

# Diary

**May 13.**—SCOTTISH G.C.C.: 26, Drumsheugh Gardens, Edinburgh. Meeting at 11.30 a.m.

**May 15.**—NORTHERN JUNIORS: Newcastle-upon-Tyne. 'Experiences in the U.S.A.," by W. E. Dobson. 2.30 p.m.

**May 19.** — LONDON AND SOUTHERN SECTION, I.G.E.: Connaught Rooms, Great Queen Street, London, W.C.2. Annual Luncheon and Chairman's Address.



*A view of the new 19,000 barrel per day delayed coking unit, using various oil-derived feed stocks, which has been designed and built by the Lumnus Company at the Paulsboro, New Jersey, refinery of the Socony Mobil Oil Company, Inc. The plant will produce 764 tons of petroleum coke per day, from feedstocks containing a mixture of seven various reduced crudes or blends of residua, including furfural extract and propane deasphalting tar. There are seven products from the plant, fuel gas, butane-butylenes, light and heavy gasolines, and light and heavy oils and coke. These products are further treated in other sections of the plant.*

## GAS COUNCIL DRAMA SOCIETY'S SUCCESS

BAD weather did not prevent a large audience from assembling in the Rudolph Steiner theatre, London, to see *Random Harvest*, a three-act play, presented by the Gas Council Dramatic Society recently.

This was the 14th presentation of the Society since its inception seven years ago. Guests in the gas-lit auditorium saw Frank Edwards playing Charles Rainier, a young man suffering from amnesia, Ronald Herberte playing Chetwynd Rainier, suffering from blood pressure, and Winifred Fraser as his wife Lydia, suffering from an excessive love of cash. Good acting and direction, with very little assistance from the prompter, combined to make the play quite a success.

### Talented cast

Others in the talented cast included Janet Griffin, Jennifer Thomas, Denis Scott-Wilson, Rae Gooding, Fred Jewitt, Margaret Beaven, Clive Offley, Marjorie Milne and John Brough. The play was produced by Tommy Cook, who was responsible for all of the previous plays. His joint stage managers were Joan Plank and Marjorie Woodman.

## Comprehensive audience?

Grammar school fifth- and sixth-formers and technical school students in Newcastle and Gosforth attended the Easter lecture given by Mr. J. A. Prigg, of Watson House, at the Rutherford Technical College, Newcastle-upon-Tyne. Entitled 'Harnessing the Flame,' the lecture featured some 40 experiments. Present were Mr. J. E. White, Deputy Chairman of the Northern Gas Board, Mr. L. A. Garratt, Industrial Relations Officer to the Board, Mr. J. S. Elliott, Principal of Rutherford Technical College, and Mr. S. Medsforth, Secretary of the Northern Advisory Council for Further Education. Mr. W. Sutcliffe, Chairman of the Northern District Education Committee, was in the chair.

## *WORKS EXTENSION*

Work has commenced on an extension to the Lancelot Works of Bratt Colbran Ltd., at Wembley, Middlesex.

The two-storey building, which will add 14,000 sq. ft. of floor area to the present factory, will contain the new despatch department and loading bays, staff and works canteen, and allow for a greatly increased area for storage of finished stocks and materials. The production lines will be re-planned to increase output potential and efficiency.

It is anticipated that the extension will be completed during the coming heating season.

## THREE WELSH UNDERTAKINGS TO JOIN UP—AND LLANIDLOES USERS BENEFIT

CONSUMERS at Llanidloes will benefit from the proposal of the Wales Gas Board to link the three undertakings, Welshpool, Newtown and Llanidloes.

This was revealed at a meeting of the Wales Gas Consultative Council at Cardiff when members were told by their Chairman, Major C. G. Traherne, that negotiations had been taking place on the proposed route of the main. The development formed part of a possible future scheme for the supply of gas to central Wales from Maelor.

### Severe Straits

'I think it is good news that this development is starting to take place,' said Major Traherne. 'Llanidloes is in very severe straits at the moment. Something had to be done because gas supplies in that area were starting to fail.'

The three undertakings would be linked so that each could help the other over the distribution of gas. 'Maelor is one of our big producing plants in the north,' said Major Traherne.

The Board also disclosed in a report to the Consultative Council that a connecting main to link Barmouth and Dolgelley had been authorised and work was due to commence later in the year.

The Board will shortly be asked what steps are being taken towards equalisation of domestic tariffs in the Principality. Members decided to press for further information despite the fact that they were advised by their Chairman that the Board was mindful of its ultimate aim.

Alderman J. H. Owen, Denbigh, who raised the question, said it was the Board's 'declared aim' and added: 'I hope ultimately we shall have one tariff for the whole of Wales.'

Mr. T. S. Charleson, Swansea, thought that to ask for a uniform tariff at this stage could be likened to asking for 'commercial petrol and super petrol at the same price.'

The Council was also informed that the Board was experimenting with a mobile radio van in the Cardiff undertaking and was in constant touch with two emergency vans. The experiment had been most successful in enabling the undertaking to deal much more quickly with escapes and other emergencies. It was hoped to introduce the system in other parts of Wales in the near future.

### *Limeys in trouble again*

'The epic-making voyage brought 32,000 barrels of liquefied methane to England—a start toward replenishing Great Britain's diminishing natural gas supply.'—*American Gas Association Monthly.*

# Retort house control must be carried out in the retort house, says engineer

## 'AVOIDING TROUBLE' THE THEME OF PAPER TO SCOTTISH JUNIORS

'AVOIDING Trouble' was the title of a paper given by Mr. W. J. Green, Area Operating Engineer for Scotland of the Woodall-Duckham Construction Co., Ltd., at a meeting of the East of Scotland Junior Gas Association at Perth.

The greatest part of Scotland's gas, he pointed out, was produced in continuous vertical retorts. Some of these were of modern design and were large works. Others were of less modern design, but were likely to have to continue in their present form for many years. Furthermore, there remained still, on even the largest works, a great deal of plant which was erected in the 1920s or thereabouts, the basic design of which had remained substantially unchanged.

'We therefore have with us in Scotland a number of people whose current efforts are engaged solely on plant which has been seen, tried and approved. It is often the tried, approved and reliable thing which at times tends to be taken for granted. It is useful, therefore, to turn our attention occasionally to problems connected with the maintenance of the older type of plant as much as with the more modern designs which have received greater publicity.

### Familiar story

'Primarily, it should be appreciated that a carbonising plant is not a precise scientific instrument nor is carbonisation a precise scientific process. The fuel which we use for heating the retort bench varies in ash and moisture contents and in grading; the way in which a producer is cleaned can vary from shift to shift and from works to works; the temperature and wetness of the retort and producer steam varies; coal deflector plates in the retorts get worn and reduce the available cracking space; a gale springs up and plays havoc with chimney pull—and so on and so forth—a story with which you who know the retort house are all too familiar.

'We cannot, when dealing with carbonising plant, sit in a control room or a comfortable office, decide on a plan of campaign worked out in mathematical detail, set our controls and then watch a series of dials and gauges. In short, the retort house control must be carried out in the retort house.

'In my experience, a great deal of time can be wasted by technical personnel in arguing, for instance, as to the reason for a high $CO_2$ figure in the producer gas or a low one in the waste gas, when far quicker results would have been obtained by going out and looking for the hole or the clinker or the lazy fireman, as the case may be. Similarly, it is possible to waste a good deal of time in the office theorising as to why such and such a plant is not producing efficient results when an inspection of the heating flues would provide a ready answer.

### Anticipating trouble

'It is not essential, if the retort house is to be properly controlled, that a reasonable proportion of the technical staff on a large works, or a reasonable proportion of, say, the foreman's time on a small one, should be available for anticipating possible trouble. The man who is thoroughly familiar with the plant would always spot minor difficulties before they became major troubles. This task will be made all the easier if the personnel concerned are given the opportunity, and take the opportunity, to become thoroughly familiar with the plant with which they are working. It is desirable that on every works there should be at least one person who knows every flue, every port—in fact, almost every brick in the retort setting; one who has a pretty good idea of what every combustion chamber and every distribution flue looks like when it is working properly and what pull or pressure condition it should be under—someone to whom the engineer's outline drawing is a *vade mecum*.

'I would appeal to senior personnel to make outline drawings readily available, particularly to junior staff. Too often the drawing is either carefully filed away in the drawing office or left rolled in the cardboard tube at the bottom of the manager's cupboard. In neither case can it be said to be readily available. Coloured outline drawings should be framed and mounted in the laboratory, the technical assistant's mess room or office.

The drawings should be available wherever the man stores the pyrometer after taking a round of temperatures or where he picks up his gloves before going to check on the flue cleaning.

'Many years ago, when called in to investigate the poor performance of one of the older plants, I was told that there was a "hoodoo" on the plant, and it would never work properly because a man had been killed there during its building! Not being an exorcist, I had to tackle the job the hard way and organise some maintenance. This, of course, was an extreme case, but I have, nevertheless, met a tendency at times for a fatalistic attitude to be taken when a knowledgeable and intensive inspection of the plant would have revealed the causes to be fairly easily remediable.'

Mr. Green stated that the causes of trouble generally fell into five categories: Inadequate knowledgeable supervision; unsatisfactory bench temperature; lack of maintenance of brickwork; lack of maintenance of ironwork and services; accumulation of dirt—in flues and producers. The first of these categories, he added, could well be the reason for the existence of the others, and the others would largely be interdependent.

Mr. Green devoted the rest of his paper to an examination of the troubles likely to be encountered under each heading, and how they might be avoided. He concluded: 'My own experience has impressed upon me most forcibly that the technical assistant who knows what results he can demand from the plant and from the men is useful, but the technical assistant who, if necessary, can show the man (and the manager) how the results can be obtained, is more likely to earn the respect of both.'

## CLOSE-DOWN

With the completion recently of the first section of the grid main between Westfield and Dunfermline, the Scottish Gas Board has closed three of the small works on the line. The works, Cowdenbeath, Kelty and Lochgelly, had been in operation for over 50 years. The gasholders in the three areas will remain in operation, and it is understood that the works will become stores and workshop premises for distribution, service and sales under the new scheme. The gas showrooms will also be retained.

*Company news*

# PARKINSON COWAN LIMITED

## Mr. Hugh P. Barker's Review

THE fifty-ninth annual general meeting of Parkinson Cowan Ltd., was held on May 4 in London.

The following is an extract from the statement by the Chairman, Mr. Hugh P. Barker:

The consolidated net surplus of £199,502 included £38,883 of profit on sale of investment. After paying our preference dividends (£19,571 net) the balance for the year available for disposal is £179,931. The Board recommends the payment of two concurrent dividends on the ordinary stock, first, 9% absorbing £38,780 net, leaving £141,151 available for allocation to reserves and, secondly, a special 1959 interim dividend at the rate of 3½% requiring £15,082 net.

We have this year created a dividend equalisation reserve. This reflects a considered policy of your Board which needs explanation. Our business is, as you know, light engineering and a substantial proportion of our turnover is in the domestic appliance field. I must say frankly that, although the outlook for the domestic appliance industry is a very promising one, it has become the habit of Governments in the past to use this adaptable and growing industry for steering the whole economy. We are therefore by no means the masters of our own fate in a year to year sense. Every manufacturer of domestic equipment is in the same situation.

Our business in domestic appliances, which started 1958 rather poorly, has accelerated rapidly since hire-purchase restrictions were removed. We believe that the excellence of our products does not require a boom condition to keep our plant operating at a steady and profitable level. All this said, the business remains an extremely exacting one.

Our business in meters is in a basically healthy state, but in this field we suffer the disability that we cannot by our own efforts increase the total market; we can only fight for a larger share of markets determined by facts outside our control. In the gas industry, for example, it seems likely that the home market for meters will be smaller this year. The water meter market leans heavily on export and there is clearly some world excess of manufacturing capacity in this commodity.

Two of our Divisions, Measurement Ltd., and Parkinson Cowan Instruments, are involved in the manufacture of hydraulic, electro-mechanical and electronic apparatus for liquid process control and for diverse applications in the gas, water and electricity supply industries. In these fields we are making solid progress. Our clients include world famous companies in the chemical, oil and food manufacturing industries, in addition to the public utility concerns with whom we have been doing business for so many years.

The year has started well. Unless the business climate changes I think that this will be a good year.

The report and accounts were adopted.

## *GETTING THROUGH TO A CAREER*

BY dialling code letters on telephones, people visiting the Gas Council's stand at the National Education and Careers Exhibition, at Olympia from May 26 to June 5, will be able to listen-in to recorded descriptions of training for various careers in the gas industry. There will be six telephones, each placed in front of a large board displaying colour transparencies.

The commentaries, lasting between one and 1½ minutes, will explain the pictures. The six fields covered will be management training, training of foremen and supervisors, professional engineering and scientific training, craft apprenticeships, sales and service training, and other training and educational activities.

On another section of the stand apprentices will be receiving instruction normally given to them at the North Thames Gas Board's training centre at Watson House in practical installation and repair work. A large map will be on display showing the whereabouts of various training establishments, of which there are over 70, run by the gas industry throughout England, Scotland and Wales.

At intervals, two Gas Council films, 'Paths of Progress' and 'Home Service,' will be shown. Education officers of the gas industry will be on duty at the stand to give information and advice.

## *West Midlands Board helps the aged*

MEASURES being taken by the West Midlands Gas Board to help elderly folk were praised at a conference called at Birmingham to discuss the welfare of old people in the home. Cookers and hotplates suitable for use by old people were shown by the Board, with examples of correct and incorrect gas connections.

The conference was attended by secretaries of old peoples' welfare committees, matrons of old peoples' homes and accident prevention officers covering the West Midlands area. Several delegates expressed appreciation of the prompt co-operation given by the Board. Appliances in need of attention were quickly attended to, with excellent work carried out by the fittings staff.

Dr. J. R. Preston, Medical Officer of Health for Sutton Coldfield and Chairman of the West Midlands Old Peoples' Welfare Committee, was particularly interested in the position of the tap on the top of some gas fires; a setting which would save old folk the labour of bending to adjust the gas.

An interesting fact to emerge at the conference was that the greatest number of accidents in the home still comes from falls.

## Change of address

The offices of Mr. James L. Thomas, Scottish area Manager of the Cape Asbestos Co. Ltd. and his staff, have moved to a new building in the Springburn district of Glasgow. Their address is now: Hobden Street, Petershill Road, Glasgow, N.1 (Telephone No.: Springburn 6144). This is also the new address of Mr. A. Armour Clark, Scottish area representative of Cape Building Products Ltd., a subsidiary of the Cape Asbestos Co. Ltd.

# COMMUNICATION IN THE GAS INDUSTRY

THE Chairman, Deputy Chairman, several Board members and some 50 managers of the Southern Gas Board recently spent a weekend studying 'communication in industry,' their object being to produce practical and specific ideas which could be applied to improving communication within their own organisation.

Mr. C. H. Leach, Chairman of the Southern Gas Board, told them all that in his opinion the many problems of communication had 'a powerful bearing on the internal conduct of any organisation, on its efficiency and its relationships with the general public.' Listening to several addresses and the discussions that followed were Sir Harold Smith, Chairman of the Gas Council, who opened the proceedings, and Sir Dennis Proctor, Permanent Secretary to the Ministry of Power.

In addition to Mr. Leach and Mr. A. F. Hetherington, Deputy Chairman, the list of speakers included: Sir Geoffrey Vickers, V.C., Director, Parkinson Cowan Ltd.; Mr. M. W. Ivens, Manager, Communication Division, Esso Petroleum Co., Ltd.; Mr. H. E. Clapp, Managing Editor, *Daily Mail;* Mr. Peter Parker, M.V.O., Director, Brooker Engineering Holdings Ltd.; Mr. J. P. Masefield, Assistant Director of Education and Training, British Motor Corporation; and Mr. Norman C. Rimmer, M.B.E., Director of Studies at Ashridge.

The syndicate method of working was used throughout the weekend. Now, the five syndicate chairmen and their colleagues will present written reports to the Chairman of the Board. These will contain recommendations for improvements where considered necessary, and will consider both informal and formal communication channels.

# THE FIGHT AGAINST CORROSION

## Exhibits of interest at the second exhibition

THE Royal Horticultural Society's New Hall, Westminster, London, was the setting for the second Corrosion Exhibition, sponsored by *Corrosion Technology* and opened by Sir Owen Wansbrough-Jones recently. Many well-known companies in the field of anti-corrosion were represented and we present here a cross-section of some exhibits of interest to the gas industry.

**British Paints Ltd.,** whose protective coatings for every type of metal under all kinds of conditions are well known, displayed a complete build-up of specifications to deal with internal corrosion in oil tankers, calorifiers, heat exchangers steam boilers and economisers, etc. An interesting exhibit showed the behaviour of several coatings while being used in connection with cathodic protection. Another exhibit illustrated what happened on the interior surface of a boiler tube while steam was being generated. Sealants for all industries were also featured on this stand.

**BTR Industries Ltd.,** indicated the results of many years experience in anti-corrosion lining, covering and fabrication. A range of rubber and ebonite compounds bonded to base metal and a demonstration circuit comprising an ebonite-lined pump, ebonite pipe valves and fittings and a glass fibre reinforced resin-bonded tank for corrosive applications were shown. Industrial hose in textile reinforced rubber, P.V.C. and P.T.F.E. for service under corrosive conditions, and a range of high-impact P.V.C. pipes and fittings, including demonstration assemblies showing methods of jointing and degree of 'set' obtainable in pipes for specific circuit design, were displayed.

**Cathodic Corrosion Control Ltd.,** specialised in cathodic protection engineering, with particular stress on the impressed-current method utilising transformer/rectifiers. The exhibit showed a selection from a wide range of anode materials available for impressed-current cathodic protection, including the CX3 lead-alloy anodes, developed by the company, and platinised titanium anodes. Cathodic protection schemes for buried pipelines, heat exchangers and the inner walls of long pipelines carrying sea water were exhibited. Also shown was a light weight transistorised all-d.c. holiday detector for the inspection of insulating coating and wrapping programmes.

**The Donald MacPherson Group** of companies, comprising **Donald MacPherson & Co., Ltd.,** and **Mody & Co., Ltd.,** showed a comprehensive range of surface coating systems suitable for combating all types of corrosive attack. Among the systems covered were those for gasholders, coke conveyor systems, retort houses, ammonia plant, purifier boxes, liquor tanks and structural steelwork, and storage tanks, pipelines refinery plant, road tank wagons and steel structural work for the gas and oil industries. A wide range of systems for the chemical industries were also shown.

**Evode Ltd.,** manufacturers of an extensive range of anti-corrosive and protective paints, exhibited Evokote Type 23, the Epikote/pitch composition, a new addition to the range of Evokote paints. This had a two-part composition giving high film thickness per coat and showed excellent resistance to fresh and salt water, acids, alkalis, oils and solvents. Bitugel, another product of the company, has become established as a heavy-duty bituminous anti-corrosive in gasworks, coking plants, steelworks and other industries. Aluminium 308 was shown, which resists temperatures up to 1,000°F. and has a good exterior durability. This material is suitable for the lower ends of chimney stacks, furnace doors, etc.

**A. E. Griffiths (Smethwick) Ltd.,** exhibited a range of the company's corrosion resistant fabrications consisting of P.V.C., reinforced plastics and titanium heating coils. The design and construction of fans has been a speciality of this company for many years, and, as manufacturers of complete dust and fume extraction plant, they turned to P.V.C. as a suitable material for the construction of fans for chemical fume extraction. An interesting feature on this stand was the roof ventilator, constructed in reinforced plastics. The ventilator had been designed for either the extraction or intake of air, and is supplied complete with a standard roof plate which is interchangeabe with corrugated asbestos sheet.

**Imperial Chemical Industries Ltd.,** Metals Division, showed some of the many uses of titanium in chemical plant and of titanium/platinum anodes for electrolytic cells and for cathodic protection. Titanium, with its two outstanding properties of excellent resistance to corrosion and a high strength/weight ratio, made it particularly useful to industry in handling many aggressive liquors. Exhibits showed that by making a titanium electrode with a thin layer of platinum, which need not be continuous, a light robust electrode was produced. This would operate successfully in many media for long periods at very high anodic current densities without deterioration. Cathodic protection of a steel pier immersed in sea water illustrated one application of the electrode.

**Metal & Pipeline Endurance Ltd.,** which provides a fully comprehensive service for the provision of cathodic protection for pipelines, including submarine, had on show magnesium and zinc sacrificial anodes, featuring particularly the Mapel patented finned anodes. The design and improvement of special instruments for corrosion control and cathodic protection also figured largely in the Mapel programme.

**John Trelawny Ltd.,** manufacturers of the Jasons Model 3B de-rusting and descaling pistol, exhibited this in addition to the Ramex air hammer. The pistol is a compressed air tool using 12.5 cu.ft. per minute at approximately 90 lb. per sq. in. pressure. It uses either 28/3-mm hardened steel needles or 65/2-mm. hardened steel needles that are ideal for cleaning all types of metal and other surfaces, including brickwork and concrete. The needles will penetrate into angles, corners, over bolt heads and rivet heads and will follow contours and uneven surfaces generally.

**Wailes Dove Bitumastic Ltd.,** have been responsible for the development, in this country, of the specialised hot enamels used to protect pipelines in the Middle East and elsewhere. Epimastic, designed to make the maintenance engineer's life easier, was also exhibited. This represented a major step forward in corrosion technology, for this bituminous epoxy coating will resist acids, alkalis oils greases solvents and salt water.

**Winn & Coales Ltd.,** makers of the famous Denso tapes for metal protection, which for over 30 years have been the protection standby for engineers, laminated a film of P.V.C. to Denso tape, and Densopol now provides all the established advantages of Denso with a tough dry exterior, giving increased mechanical strength and an even higher electrical resistance. Simple, cold on-site application enables Denso to be handled by inexperienced labour. Another example of the Denso expansion in post-war years is the complete cathodic protection service, from initial survey to regular maintenance, which the company is operating on an increasing scale. A contracting department has been formed, based on the northern area H.Q. in Cheshire, capable of undertaking any required application, but with its main objective the servicing of structural steelwork.

**Yorkshire Imperial Metals Ltd.,** exhibited plastic covered copper tubes, Kutelex, for gas and water service pipelines installed in aggressive surroundings and also plastic covered instrumentation tubing for use in corrosive atmospheres. A particularly interesting exhibit showed various forms of corrosion; corrosion-erosion, dezincification, season-cracking, steam erosion, pitting and many others.

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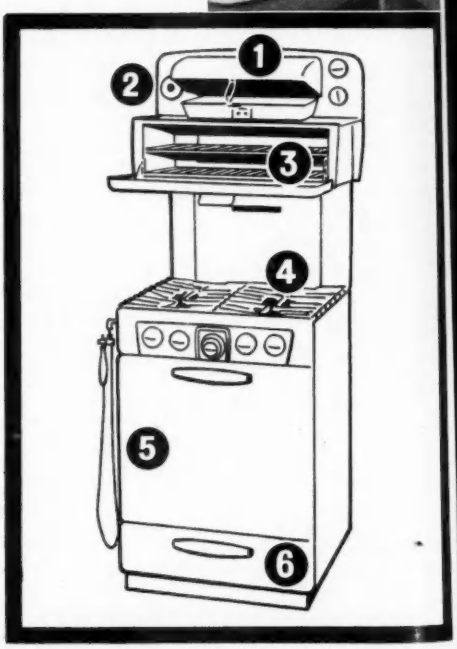


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*From a paper to be presented to the Eastern Section, I.G.E., at Hitchin.*

# Anti-Freezing Measures for Gasholders

By J. A. SCOTT, B.Sc., A.M.Inst.Gas E.,

DIVISIONAL PLANNING ASSISTANT, LINCOLNSHIRE DIVISION, EAST MIDLANDS GAS BOARD.

THE first point to consider is what have we to face in the way of severe weather during the winter in this country. The longest period of continuous frost in the United Kingdom was recorded at Glenlivet, Banff, between January 26 and February 19, 1947—a period of 25 days. The temperature rose above 32°F. for two days on February 19-20 and then until March 2 the frost continued. Fortunately, such conditions were not experienced further south.

The first quarter of 1947 is probably the most prolonged period of cold weather experienced in this country within memory. It would seem reasonable, therefore, that provision should be made for anti-freezing equipment which will afford protection under conditions similar to those which prevailed at that time.

When the water in a tank with the surface at ground level is cooled by a fall in atmospheric temperature, the heat losses are almost entirely from the surface of the water, since the body of earth surrounding the tank is slow to cool compared with the atmosphere. The heat losses at the surface cause a fall in temperature with an increase in the density of the water. The denser water sinks and with successive surfaces being exposed a slow circulation is set up and the temperature of the main body of the water falls. This circulation persists until a temperature of 39°F. is reached. From this point further cooling results in a decrease in density, i.e., the water expands. This causes the circulation to stop and, in consequence, the heat losses are confined to the top surface of the water which cools rapidly, ice forming at 32°F. With continued cooling the ice layer thickens, since the water immediately below it is at its lowest temperature and density. The critical temperature is therefore 39°F., and provided the surface of the water can be maintained at or above this temperature, the prospect of freezing is remote.

## Additional Heat Losses

With holder tanks situated above ground the same physical considerations apply, but additional heat losses from the tank walls must be taken into account. It has been estimated that this loss amounts to about 34 B.t.u. per sq. ft. of tank wall with the tank water at 42°F. and the atmospheric temperature at 20°F.

With static air conditions the variation of water temperature round the perimeter of a tank or cup is negligible, and even on bright days the winter sun does not appear to give any additional warmth to the water on the sunny side. However, wind does have a marked effect and observations have shown variations of up to 6°F. between the north and south cup temperatures. Not unexpectedly, the greatest variation is recorded with the stronger winds. Although the point has not received detailed study, it does appear that investigation into the value of wind breaks might be worth pursuit.

The establishment of holder stations, some of them virtually unmanned, at sites which were formerly manufacturing stations has emphasised in some degree the need for a study of anti-freezing methods. As an operational unit the gasworks had steam readily available for the prevention of freezing and in addition the very fact that the works was a relatively warm spot in a cold world helped with the problem. There was always a background of warmth radiating from the plant and underground storage wells and mains helped to keep the ground and gas temperature up. The holder station receives gas at ground temperature from some remote compressing station and usually if steam is available the medium is a standby boiler manned by what labour can be made available (for the most part at overtime rates). Bearing these points in mind we may now consider the methods available for dealing with gasholder freezing.

## Available Methods

If one excludes the time-honoured custom of breaking the ice and removing the chunks by hand, the methods available may be divided into four groups: (1) Heating and water circulation by steam injection; (2) heating and water circulation by means of a hot water circulator; (3) electrical heating; and (4) electrical heating combined with mechanical circulation. A further possible method is by the introduction of anti-freezing additives to the holder water but this is not usually considered on the ground of expense and/or corrosion problems.

Steaming has for many years been the main weapon against frost. The application is well known and where steam is conveniently available it will no doubt continue to find a place in anti-freezing equipment. Steam is flexible in use, easy to keep an eye on and satisfactory in performance. It is, however, by no means cheap and the maintenance costs of the flexible hose, valves, injectors and pipelines can be heavy. Without lagging, heat losses are considerable and the danger of the steam line waterlogging and freezing is a hazard which must engage the closest attention.

At Lincoln there are two holders, a three-lift of 1.5 mill. cu.ft. capacity and a four-lift of 3 mill. cu.ft. capacity. Both are spiral-guided with overground tanks. The holder site is some distance from the main steam supply and steam for anti-freezing is provided by two vertical boilers, one working and one in reserve. It is, therefore, possible to get a reasonably accurate figure of the cost of steam protection. Over the five years, 1953-1958, repairs, renewals and cleaning cost a total of £977, including labour, or an average of £195 per annum. Based on an air temperature of 20°F. and an initial water

temperature of 42°F. the total steam requirements are approximately 1,500 lb. per hour with feed water at 60°F. This entails a fuel consumption of about one ton of coke per eight-hour shift. During the last five years such severe conditions have fortunately been rare and not unduly prolonged. In consequence, the average coke consumption has been of the order of 2 tons per day. It is the custom to keep the boiler under slow fire when frost is likely and for this duty up to 10 cwt. of coke per day are necessary with periodic attention to the fire.

The merits of the small, oil-fired, high steaming package boiler fitted with automatic ignition, flame failure devices, water level alarms, etc., have received attention. The unit is efficient but is not without its drawbacks. Oil storage tanks with adequate fire protection are required, a supply of electricity is necessary, some form of water treatment advisable, while the number of automatic controls liable to failure make some degree of attendance essential. Since some attendance is required it would appear to be just as simple to fire a boiler manually with coke. Furthermore, the amount of useful work performed by the boiler, vital though it may be, hardly warrants the costly annual overhaul.

The hot water circulating system is quite suitable for the small holder station with single lift holders, and where labour is available for periodic attention to stoking the coke-fired boiler has been found to give excellent protection. The boiler may be of the conventional type but a superannuated vertical steam boiler fitted with flow and return pipes as in an ordinary circulating system makes a satisfactory unit. It is, of course, necessary to have sufficient firebox capacity to permit the fire to be banked up overnight. The disadvantage of the system is that it is really only suitable for single-lift holders with above-ground tanks. The layout is quite simple and it has been found that 9 to 12 in. difference in head between the flow and return will give good circulation. Lagging the flow and return pipes is almost essential apart from economic considerations. Suitable provision should be made for draining the system.

With regard to the position of the flow and return pipes these may be diametrically opposite each other or more or less adjacent with appropriate bends in the desired direction. As a matter of personal choice I prefer the latter arrangement with the flow pipe near and towards the north-east point on the holder periphery. With divided stream the flow may be unbalanced and afford uneven protection.

### Thermostatic Control

Where labour is not readily available the gas- or oil-fired boiler is an alternative and, moreover, thermostatic control can effectively limit fuel consumption. Flame failure devices should, of course, be included.

A disadvantage of the gas-fired boiler is that what is virtually a major consumer for the undertaking appears at a most inopportune moment. This objection is, I think, valid and in considering the installation of gas-fired equipment, due regard must be paid to the load which will be imposed on the local system.

There are a number of small stations in Lincolnshire where hot water circulating systems have been installed. The holder tanks are all above ground.

The standard method of control of a gas boiler is by means of a thermostat which cuts off the gas supply when the water in the flow pipe reaches a predetermined temperature. This is not satisfactory for anti-freezing purposes since the boiler cuts out with a sluggish flow. The whole operation may also become costly, particularly as the natural inclination is to light up if weather conditions portend frost. Weather forecasting is at its best an uncertain science and if the weather becomes milder, peace of mind has been bought at a high price. Conversely, if mild weather is forecast and frost follows, serious damage can result if the boiler is not in action.

With the increase in the number of unmanned stations with single-lift holders, it became obvious that some more suitable and precise form of automatic control was desirable and indeed very necessary.

The operation of the thermostat control of a gas boiler is probably familiar. The pressure of gas to the burner acts on the underside of a weighted diaphragm, which maintains the valve in the open position. A weep orifice allows gas to pass to the upper chamber of the governor. The weep gas is coupled by way of the boiler thermostat to the escape burner. The boiler thermostat is set according to temperature requirements and when the setting is reached, the valve of the thermostat closes allowing pressure to build up in the system.

This results in the equalising of pressures on the upper and lower parts of the diaphragm and the valve closes under the weight of the valve disc. A subsidiary control for controlling room temperature may be connected in series with the boiler thermostat. During the past winter, one of these thermostats adapted for the appropriate temperature range was connected to the weep pipe at the boiler thermostat outlet and fixed in the open air to a metal box. The experimental thermostat operated successfully, switching the boiler on at 33°F. air temperature and shutting down at the same temperature.

### Comparison with System

The holder in question was at Heckington and it was thought that comparison with the manually operated heating system of similar capacity at Bottesford would be instructive. This was indeed the case, though hardly in the way anticipated.

The gas consumption at Bottesford was considerably less than at the automatically controlled Heckington. The reason was not far to seek. At the unmanned Heckington station the heat was turned on when the air temperature fell, whereas delay was possible at the manned station and the man on the spot used his judgment as to the necessity of applying heat.

The reliability of the thermostat was, however, established and had confirmed our earlier conclusion that control by air temperature was not enough. We have now developed the idea so that control of the boiler is by dual thermostats working one on air temperature and one on the temperature of the water in the return pipe. I shall refer to this point later, but it is not out of context to devote a few moments to it now.

The weep pipe from the air thermostat is taken to a second thermostat in the return pipe, set to open when the water is at 36°F.

I might add that the experimental thermostats have been replaced by specially calibrated instruments. In operation the air thermostat opens at 32°F., but until the water temperature falls to 36°F. the boiler does not come into operation. When the air temperature rises above freezing the thermostat valve closes and the boiler

shuts down, even though the holder water is below 36°F. It may well be that our temperature settings have to be revised in the light of further experience. We are still developing our ideas, but by the system of control outlined it is hoped to make a significant saving in the amount of gas consumed without impairing the effectiveness of the anti-freezing protection. The boilers are, of course, fitted with flame failure devices.

During the past few years, increasing consideration has been given to the use of electrical heating elements in the cups and tanks of gasholders. Soon after the end of the last war experimental work was carried out at Newcastle and electrical heating was applied to a new gasholder erected at Gosforth. Mr. W. R. Garrett, Constructional and Consultant Engineer to the Northern Gas Board, had determined experimentally the heat losses from the water in the cups and was able to calculate from the data obtained the heat requirements to compensate for these losses. It was found that a loading of 60 W per ft. run of heating cable was adequate for protection with an ambient air temperature of 12°F. (i.e., 20°F. of frost). The electrical supply was controlled by thermostats which switched on the current when the water temperature dropped to 36°F. The current was cut off when the water temperature reached 40°F.

Up till 1949, when Mr. Garrett read his paper to the I.G.E., experience of the system was limited due to the incidence of two mild winters, but in the years since 1949 the installation has proved satisfactory. The copper sheath of the heating cable is still in excellent condition with no evidence of corrosion. Originally the thermostats controlling the installation were immersed in the cup water but these were subsequently modified for air temperature operation. This was because of the difficulty in obtaining a satisfactory thermostat for immersion in water.

## Air Temperature Control

Automatic operation of the heaters is controlled by a temperature regulator. In the case of air temperature control a stainless steel sensitive bulb is fixed in an exposed position over the switch house. This is connected by a capillary to a Cambridge thermometer regulator which is provided with a dial mounted on the control cubicle. The regulator is preset at the required temperature, the heating being switched on when that temperature is reached. By providing a double contact regulator switch, it is possible to apply the heat in two stages. This is a refinement where the cost of electricity is a major consideration but to my way of thinking the saving effected when a cheap electric tariff is available hardly merits the additional capital outlay involved.

With the Crowther-Dryden system a transformer is installed as near to the holder as possible to avoid a long run of low tension cable.

Other systems dispense with the transformer, and by applying higher voltage to the heaters, cable sizes are reduced. With higher voltages, however, it is necessary to provide earth leakage protection equipment. The equipment introduced by Electro-Installations Ltd. works on 415 V a.c. and includes earth leakage and earth proving equipment. This system and the Crowther-Dryden system have been installed at a number of works in Lincolnshire.

Where a station is manned throughout the day manual control is all that is necessary. Thermostatic control can be operated by air temperature or water temperature. Although the air temperature regulator is much cheaper than the water thermostat, control by water thermostat, as originally used by Crowther and Garrett, is more logical and also more economical since a light frost of a few hours' duration does not call for the operation of the heating equipment.

A combination of the two methods is probably the most economical.

With air temperature control, the heaters may often come into operation long before there is any likelihood of tank or cup water freezing. On the other hand, water temperature thermostats bringing in the heaters at, say, 36°F. may continue in operation after the atmospheric temperature has risen well above freezing. In the most recent installations at Grantham air and water thermostats have been fitted in series. The air thermostat is set to come in at 32°F. but until the water temperature is at 36°F. or lower the circuit is not closed. At 36°F. the water thermostat operates the switch and the current is turned on. If the air temperature should rise above freezing point the air thermostat cuts off the current.

## Electrically-driven Pumps

The heating of the water in the cups presents little difficulty, the loading of 60 W per ft. run being in excess of calculated requirements. The same may be said of tanks at ground level where if heating is thought necessary the normal heating element should suffice. In the Gosforth installation circulation (of the tank water) was effected by four electrically-driven pumps. These have been satisfactory even in the coldest weather to date.

Mechanical circulation of the water in the cups has not, to my knowledge, been practised in this country and in this respect I would refer to a system which has been developed in France. Installations on two spirally-guided holders of 190,000 cu.ft. and 350,000 cu.ft. capacity at Châlons sur Marne and St. Quentin have been described. The equipment comprised a heating element immersed in the water seal and a water circulator. The water circulator consists of a bronze propeller dimensioned according to the width of the cup mounted on a shaft and driven by a .3 h.p. motor at 1,500 r.p.m. The propeller is fitted so that it rotates in a sloping plane, enabling an upward flow of the water to be achieved. The average circulation speed produced in the cup periphery is 15-20 ft. per minute. Higher circulation rates are said to increase heat losses.

By use of the mechanical circulator it is averred that down to an ambient air temperature of 23°F. circulation is sufficient for protection. Below that temperature the thermostats bring the heating elements into operation. Without being dogmatic I would hesitate to rely on mechanical circulation without heat for prolonged periods with an atmospheric temperature between 23°F. and freezing point. Heat losses are admittedly slow, but all that circulation does is to ensure that the water is kept at a uniform temperature throughout its depth. Ultimately the water temperature will reach 32°F. and then the whole bulk will freeze rapidly.

An interesting feature of the installations described is the provision of a manostat governed by the holder pressure. This switches the current off or on as the holder uncups or cups up. The loading of the heating cable is 120 W. per ft., which is about double the loading

usual in this country. The heat requirements are, however, calculated on a basis of 36°F. of frost.

When the holder tank is above ground it is necessary to take into account the heat losses from the tank walls and in this respect our experiences at Gainsborough with a three-lift, 1 mill. cu.ft. capacity holder put to work in 1956 are of interest. Electrical heating was installed but it has been found that during two very cold spells during its life, ice has been formed in the tank. Though no great difficulties have yet arisen the formation of ice has caused no little concern since the holder is some distance from the works and is the main source of supply to a busy manufacturing area.

### Additional Heating Element

More recently, in January, 1959, similar conditions were experienced and our investigations indicate that additional heating is required. It is now proposed to add an additional heating element to the tank water. This will double the heat input to the surface of the tank water and we think that adequate protection will be afforded during a prolonged period of hard weather. The total heating proposed for the tank will not fully compensate for the heat losses from the tank walls. It is calculated, however, that the rate of cooling of the bulk of the water will be sufficiently slow as to inhibit any serious ice formation.

A recent check on a holder fitted with heating cable rated at 100 W per ft. revealed that with an air temperature of 10°F. the water in the cups was maintained at 50°F. and the water in the tank at 35°F.

One of the snags of electrical heating is the cost of power taken from the electricity boards. 'Maximum demand' and 'industrial' tariffs which permit the use of electricity without restriction are unfavourable systems of charge for this spasmodic and heavy load. Special tariffs are usually available for installations which are separately wired and used only during certain hours. These 'off peak' tariffs vary between the electricity boards. Two boards supply Lincolnshire and both offer 'off peak' tariffs. A supply is available for 128 hours in one instance and 122½ hours in the other. The main break is of 5 or 5½ hours' duration in the forenoon.

### Hourly Records

It may well be asked if it is wise to have the heating to the holders cut off for as long as 5½ hours. Admittedly, it would be reassuring to have the heat on all the time, but is it really necessary? And how much would it cost? Hourly records were kept of the air temperature on a Stevenson screen at Lincoln during January, 1959.

From an examination of the readings it is reasonable to generalise and say that the atmospheric temperature rises significantly during the forenoon period, and provided the water temperature is in the lower forties at 7 a.m., the problem of freezing is not a serious one. In our limited experience we have had no real trouble and at Gosforth where power is now taken on the off peak tariff they have at no time been in difficulty with the anti-freezing arrangements. In fact, during intensely cold weather up to 1 in. of ice has been formed in the cups during the restricted hours but this has quickly dispersed when the heating has been restored.

During the past few years the question of anti-freezing equipment has become important at a number of Lincolnshire undertakings due to the works becoming holder stations. For example, at Grantham and Sleaford the matter was of some urgency. At Grantham the boilers were in need of extensive repair and were situated on land which it was proposed to lease to a local firm. At Sleaford the boilers were housed in a building which had already been sold but pending occupation by the purchaser the boilers were still in service. Since at both works the only duty required was to provide steam for anti-freezing, no costly moving of the boilers appeared to be justifiable and the installation of a vertical boiler burner coke breeze seemed to present a cheaper alternative.

We had also a limited experience of electrical anti-freezing and an assessment of the comparative costs of steam and electrical anti-freezing was made, taking Grantham and Sleaford as typical stations. It will be appreciated that a comparison of this nature can easily mislead one, due to a number of factors which must be assumed. The two most important points are the number of days on which anti-freezing measures will be required, and secondly, the degree of control exercised by the local management over steam anti-freezing, which affects the number of days on which the boilers may be worked unnecessarily.

### Negligible Cost

From the appraisal given in an appendix to the paper it would be seen that allowing a capital cost of £1,850 at Grantham and £1,350 at Sleaford the difference between the cost of operating breeze-fired boilers and electrical anti-freezers is negligible. The assessment is biassed somewhat against electricity since no capital costs are charged against the steam production and it is assumed that the electrical anti-freezers will be in operation continuously during the operating period, whereas in fact these will cut out when the temperature rises above freezing.

Even in the extreme case of working on full duty for 30 days without any standby period whatever, the balance in favour of steam at the larger station is small. As the station becomes smaller the costs become more favourable towards electricity since labour charges remain the same and fuel costs are unlikely to fall in the same proportion as the size of the undertaking.

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## Association Membership for Chemical Engineers

THE latest (November, 1958) edition of the regulations for the admission of student, graduate, and corporate members, and for the examination of the Institution of Chehical Engineers, contains some guidance on training and experience requirements for associate membership. Also of interest is the new syllabus for engineering drawing of the Institution examination which is to come into force starting with the 1960 examination. The latter has been inserted in the regulations as a leaflet. The engineering drawing syllabus has been revised with a view to giving teachers and students more advice on the content of this part of the examination.

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## APPOINTMENTS VACANT

**LISBURN URBAN DISTRICT COUNCIL**
(GAS DEPARTMENT)

WORKS FOREMAN WANTED

**THE LISBURN URBAN DISTRICT COUNCIL** invite applications for the post of Works Foreman in the Gas Department.

Applicants should have sound practical knowledge and experience of the operation and control of Gas Works Plant, including Vertical Retorts and Automatic Carburetted Water Gas Plant.

Terms and conditions of appointment may be obtained from the Gas Manager, Bridge Street, Lisburn.

The person appointed will be required to join the Northern Ireland Local Government Officers' Superannuation Scheme.

Applications stating age, experience and salary expected will be received by the undersigned up to 12 noon on Tuesday, May 12, 1959.

R. C. NEWELL,
Town Clerk.

Town Hall, Lisburn.
April 23, 1959.

**WALES GAS BOARD**
RHYL PRESTATYN AND ST. ASAPH UNDERTAKINGS

ASSISTANT ENGINEER

**APPLICATIONS are invited for the appointment** of Assistant Engineer at the above Undertakings which receive gas in bulk from the North Wales Gas Grid.

Applicants should possess experience and suitable technical qualifications in modern methods of production and distribution. As the duties of the successful applicant will include such assistance as may be required in the operation of the North Wales Gas Grid, experience of high pressure long distance transmission would be an added qualification.

Residence in the district is necessary; a house is available at a reasonable rental.

The salary of the post is within Grades APT. (A) 8/10 (£773-£992 per annum), the initial placing depending upon the qualifications and experience. The post is pensionable. The successful applicant will be required to undergo a medical examination.

Applications stating age, together with details of present and previous appointments and accompanied by the names of two referees, should reach the Secretary, Wales Gas Board, Windsor Place, Cardiff, within 14 days of the appearance of this advertisement.

**WALES GAS BOARD**
PONTYPOOL UNDERTAKING

ASSISTANT DISTRIBUTION ENGINEER

**APPLICATIONS are invited from** suitably qualified persons for the position of Assistant Distribution Engineer.

The successful applicant must be fully conversant with modern Gas Fitting Techniques and will be required to take full charge of the Gas Fitting Department of the Pontypool Undertaking and to render technical assistance to the Mains Department.

Possession of the Higher National Certificate in Mechanical Engineering or equivalent is essential and Corporate Membership of the Institution of Gas Engineers (Gas Supply) will be considered an advantage.

The commencing salary will be within Grade APT. 10 (Provincial 'A') at £892-£992 per annum of the National Salary Scales for Gas Staffs, placing according to experience and qualifications. Housing accommodation can be obtained within the area.

The appointment is pensionable. The successful candidate will be required to pass a medical examination.

Applications, stating age, qualifications and particulars of training and experience, together with the names of two referees, should reach the undersigned within 10 days after the appearance of this advertisement.

A. FACER,
General Manager and Engineer.

Wales Gas Board—Pontypool Undertaking,
P.O. Box No. 10,
Gas Offices,
Hanbury Road,
Pontypool, Mon.

**EAST MIDLANDS GAS BOARD**
NOTTS. & DERBY DIVISION

HOME SERVICE ADVISERS

DERBY, LONG EATON/ILKESTON & MANSFIELD DISTRICTS

**APPLICATIONS are invited for the positions of** Home Service Advisers in the above districts at a salary rising to £625 per annum according to qualifications and experience.

Candidates must be capable of working independently and be in possession of a recognised diploma in cookery and/or domestic science. They should be proficient in the practical demonstration of gas cooking, laundering and other appliances involving the use of gas in the home.

The positions are pensionable, and the successful applicants will require to pass a medical examination.

Applications stating district applied for, age, qualifications and experience, and giving full particulars of training, together with the names of two referees, should be addressed to reach the undersigned within 14 days following publication of this advertisement.

K. L. PEARCE,
Divisional General Manager.

East Midlands Gas Board,
Notts. & Derby Division.
P.O. Box No. 62,
Friar Gate,
Derby.

P/JM.

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D. A. FOSTER,
Group Manager.


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